

APPLICATION

FOR

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TITLE: **AGGREGATING WEB DATA ON CLIENTS AND
DISTRIBUTING THE AGGREGATED DATA TO
WIRELESS HANDHELD DEVICES**

INVENTORS: **MURTHI NANJA**

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AGGREGATING WEB DATA ON CLIENTS AND DISTRIBUTING THE
AGGREGATED DATA TO WIRELESS HANDHELD DEVICES

Background

This invention relates in general to aggregation and
5 distribution of web data.

Anyone with an Internet connection can access up-to-
date information for stocks, news, sports, weather, etc.
from millions of web sites. The information can be static
information such as company product brochures or dynamic
10 information such as stock quotes and weather. Today
Internet users worldwide access information through their
desktop personal computers, for example, using either their
dial-up modem connections at home or their local area
network connections at work.

15 Typically, information downloaded from a web site to a
web browser is in HyperText Markup Language (HTML). When a
user accesses a web site, the web browser first downloads
the HTML contents to the user's local system, then
processes the downloaded HTML document, and finally
20 displays the web content to the user. In addition to the
web browser, any other applications running on the local
system can process and display HTML pages. Common Gateway
Interface (CGI) scripts and middleware components running
on the web server are commonly used to generate either
25 static or dynamic HTML content. Users may access web

content via wireless handheld devices such as Personal Digital Assistants (PDAs), web tablets, and cellular telephones as well as desktop or laptop computers.

Many wireless operators are currently providing
5 wireless Internet access for handheld devices through second-generation (2G) cellular networks such as GSM (Global System for Mobile Communication), IS-95 CDMA (Code Division Multiple Access), IS-136 TDMA (Time Division Multiple Access), and PDC (Packetized Digital Cellular).
10 These 2G cellular wireless networks provide data rates between 9.6 Kbps and 14.4 Kbps. Most of these 2G cellular technologies are based on circuit-switched operations.

Since the wireless handheld device subscribers are charged on the basis of connection time, wireless data
15 services are expensive when compared to those of similar wireline Internet access services. Because of the costs involved, many handheld device owners are reluctant to use wireless Internet access, and only use their handheld device to synchronize Personal Information Management (PIM)
20 software.

Wireless handheld device users may access information from individual web sites by accessing target Uniform Resource Locators (URLs) directly from their wireless handheld units connected to the Internet via a cellular
25 network. Alternatively, users may access target URLs indirectly by synchronizing their device with their desktop

system which acts as a proxy for the target URLs. In the second method, the desktop system can cache all predefined web pages for the handheld unit. Each time the user wants to access information from a different web page, a new session may be established, incurring increasing cellular charges.

Thus, there is a need for better ways to access information on the Internet using wireless devices.

Brief Description of the Drawings

10 Figure 1 is a block diagram of a web data aggregation and distribution system in accordance with one embodiment of the present invention;

Figure 2 depicts software components used in the data aggregation and distribution system in accordance with one embodiment of the present invention;

Figure 3 depicts the data aggregation method employed by the data aggregator application in accordance with one embodiment of the present invention; and

Figure 4 is a flow chart for software in accordance with one embodiment of the present invention.

Detailed Description

The data aggregation and distribution system 100, shown in Figure 1, includes wireless units 101, processor-based system 103, Internet 104, and web servers 105. Buses 108 and 110 may be serial ports or Universal Serial Bus

(USB) based cable or wireless interfaces between the wireless units 101, and the system 103, respectively. Hypertext Transfer protocol (HTTP) 112 and 114 are the protocol interfaces between the system 103 and the web servers 105, respectively. In the illustrated embodiment, three sample web servers, 105a, b and c (i.e., weather, stock quote and news) are depicted, but the nature of the information from the web servers can be anything relevant to mobile users (e.g., product price quotes and product inventory level from suppliers).

Wireless interfaces 110, such as Bluetooth wireless interfaces, may be located between the wireless units 101 and the system 103. The Internet 104 couples the system 103 and the web servers 105. The Bluetooth wireless interface is a short-range (within 10 meters) radio communication technology developed specifically as a cable replacement solution for desktop systems with standard peripherals such as keyboards, mice, printers, and digital cameras. In addition, Bluetooth has capabilities to set up point-to-point or point-to-multipoint ad hoc networks among many Bluetooth devices (e.g., desktop systems and PDAs).

The wireless units 101 can be handheld, mobile devices in one embodiment, such as PDAs, cellular telephones, or web tablets, or they may be other processor-based non-handheld, non-mobile devices. Each wireless unit 101 has cellular wireless connectivity and a HTML web browser. The

system 103, acting as an intermediary or as an "information hub" for the wireless unit 101, provides aggregated web information to each wireless unit 101. The system 103 may be any processor-based system including a desktop computer or processor-based appliance, as two examples. The system 103 may include a processor 113 and storage 115 coupled to the processor 113. The web servers 105 act as information sources for the system 103. In one embodiment, no modifications or additional components, either hardware or software, may be needed on any of the components depicted in Figure 1 other than the system 103.

As shown in Figure 2, a web data aggregator application 207, running on the system 103, performs integration or aggregation of various types of information relevant to each unit 101 user. The web aggregator application 207 is responsible for interacting with a web server 105, extracting desired information such as weather, stock quotes and news, and then aggregating this information in a manner that is meaningful to users of the wireless units 101. The applications 207-209 and the content 210 may be stored in the storage 115.

The web server 105 processes the HTTP requests 112/114 received from the system 103 using CGI scripts 211 and then sends a response as a HTTP response 114/112 to the system 103. The CGI scripts 211 access the target web content 213 directly or through middleware software component 212 and

generate data, for example, in eXtensible Markup Language (XML) format in one embodiment. As an example, stock portfolio data gathered on the web server 105 in XML format may include information such as ticker, time, last price, open price, day's high, day's low, volume and average volume.

The web data aggregator application 207 gathers data (such as a stock portfolio) for various kinds of information in one embodiment. The web data aggregator application 207 may use Application Programming Interfaces (APIs) published by the web content vendors for their services in one embodiment. Using the APIs may reduce the need to retrieve HTML documents from the web server 105, parsing them to obtain user requested web data, and making the requested data available for aggregation. In addition, in one embodiment, the data aggregator application 207 may be unaltered, even if the format of the target web server 105 content is changed by the content vendor. Once the web data aggregator application 207 completes the task of gathering data from various web servers 105, in one embodiment, it may process the data using one or more XML Stylesheet Languages (XSL) to generate the aggregated content 210.

A data synchronizer application 208 running on the system 103 transfers the aggregated content 210 to a wireless unit 101. Data synchronization can be triggered

by connecting a wireless unit 101 to the system 103 via
interfaces 108/110. Alternatively, synchronization may be
triggered by explicitly invoking a special command in the
data synchronizer application 208, if the wireless handheld
5 unit 101 is already connected to the system 103. By
default, the data synchronizer application 208 transfers
the aggregated content 210 to the wireless handheld unit
101 whenever there is a new information in the aggregated
content 210. The user may configure the data synchronizer
10 application 208 to modify the default data synchronization
behavior.

A data aggregator configuration utility 209 running on
the system 103 changes the data aggregator application's
207 behavior. By default, the data aggregator application
15 207 may attempt to gather web data at a predetermined time
of the day set by the user. However, this can be changed
by the data aggregator configuration utility 209, under the
direct control of the user, to gather data whenever the
system 103 is in idle state or based on some other user-
20 specified criteria.

The data aggregator application 207, data aggregator
configuration utility 209, and the data synchronizer
application 208 may be combined into a single executable
application on the system 103. In an embodiment in which
25 the web data aggregator application 207 also includes the
functions of the application 208 and utility 209, the

application 207 receives and stores user web data requests .
as indicated in block 402 of Figure 4. Upon the occurrence
of an appropriate event, such as a period of low activity
on the system 103, as indicated in diamond 404, the
5 requested web data is automatically accessed over the
Internet as indicated in block 406. The accessed web data
is then stored as indicated in block 408.

Upon the occurrence of a predetermined event, such as
a predetermined time or a user request from a wireless unit
10 101, as indicated in block 410, the accumulated web data is
transferred from the system 103 to the unit 101 as
indicated in block 412.

The wireless unit 101 has an Internet web browser 205
that is capable of displaying standard Internet content
15 formats such as HTML and XML. The web browser 205 running
on the wireless unit 101 may be used to browse the
aggregated content 206 downloaded to the wireless unit 101.

In one embodiment, the data aggregation method 301
takes XML data files 302, 303 and 304 generated from their
20 respective web servers 105 and one or more XSL stylesheets
305, 306 and 307 for each type of web data information, as
shown in Figure 3. An XSL stylesheet describes how the XML
source content should be styled, laid out and paginated
onto a web browser 205 running on the wireless unit 101.

25 The data aggregation method 301 may accept both XML
and XSL documents. The method may accept both XML and XSL

for the handheld units 101 as aggregated data in HTML or
extensible HTML (XHTML) format. The data aggregation
method 301 can generate aggregated content in formats other
than the default HTML or XHTML format by simply adding
5 additional stylesheets.

The aggregated data in HTML format 308 may be
represented as a single HTML file or a group of hyperlinked
HTML files as two examples. Typically these files may be
located in a single directory on the system 103 so that the
10 data synchronizer application 208 can easily transfer them
to the user's wireless unit 101.

The following example illustrates one embodiment of
the application of the principles described herein.

1. A mobile user, who owns a system 103 at his/her
15 office and a wireless unit 101, walks into his/her office
at 8:00 in the morning, plugs in the unit 101 into a cradle
that is attached to the system 103, and then powers up the
system 103.

2. During the system boot-up sequence, the system
20 103 automatically runs the data aggregator application 207,
the data synchronizer application 208, and the data
aggregator configuration utility 209. These software
components are configured during set up to automatically
launch immediately after the system power-up.

25 3. The standard synchronizer agent for the unit 101
automatically transfers the mobile user's calendar, e-

mails, contact information, and other related information to the handheld unit 101 so that this information is readily available to the mobile user when he/she is temporarily away from the office.

5 4. The mobile user performs routine tasks such as reading or sending e-mails, accessing Internet or intranet web sites, developing code, writing documents, and so on.

 5. At the end of the day, around 5:30, the data aggregator application 207 automatically initiates the
10 aggregation process and generates new aggregated content from various predefined web servers. This data aggregation activity is transparent to the mobile user.

 6. Through the data synchronizer application 207, the mobile user transfers the new aggregated content to
15 his/her wireless unit 101 before leaving the office for the day.

 7. The mobile user leaves the office with his/her unit 101.

 8. The mobile user browses the aggregated content
20 using the web browser 205 at home.

 Although the above usage scenario is intended for a corporate mobile user, the present invention is not so limited. The underlying principles can be easily applied to aggregate and distribute data in a consumer home
25 environment or any other scenario.

Many existing wireless data services that are based on second generation (2G) wireless technologies are expensive when compared to those of similar wireline Internet data services. As a result, many mobile handheld device owners
5 may prefer to view the aggregated data in offline mode rather than directly connecting to the Internet. In some embodiments of the present invention, a mechanism addresses this user preference issue. Some embodiments may provide a way to aggregate data on a user's local system 103 and then
10 display the data on one or more units 101.

Some embodiments may have advantages over aggregating data on the web server 105, including reducing the wireless unit 101 owner's Internet connection time charges as information is aggregated and distributed using his/her
15 system 103, providing opportunities for customizing aggregated data based on the wireless unit 101 owner's preferences, and providing a default view of the aggregated data to the unit 101 owner, if required. Aggregation of data from various web sites on a system 103, for example,
20 may provide a unified view of information to the unit 101 owner and thereby increase his/her productivity. A wireless unit 101 owner may determine when to aggregate and distribute relevant web data on his/her system 103.

In some implementations, no changes or modifications
25 may be needed to the wireless units 101 and no special software or hardware component needs to be installed on

wireless units 101. Instead, the system 103 may alone accomplish the aggregation in one embodiment.

In one embodiment, data may be aggregated whenever the system 103 is in an idle state. In addition, the local
5 user can configure the system 103 to aggregate data at a predetermined time of the day using a configuration utility 209.

While the present invention has been described with respect to a limited number of embodiments, those skilled
10 in the art will appreciate numerous modifications and variations therefrom. It is intended that the appended claims cover all such modifications and variations as fall within the true spirit and scope of this present invention.

What is claimed is: